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Selected Papers from "The 6th China Conference of Wireless Sensor Networks"

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Editorial

Selected Papers from "The 6th China Conference of Wireless Sensor Networks"

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Integrating the capabilities of distributed sensing, computing, and communication, wireless sensor networks (WSNs) have been transforming the way we interact with the physical and human worlds. While traditional WSNs (e.g., those for smart vineyard) have gone from research to real-world deployments, WSNs continue evolving along multiple dimensions such as content, mobility, space, and architecture. For instance, wireless multimedia sensor networks, mobile wireless sensor networks, wireless underwater sensor networks, wireless underground sensor networks, and wireless sensor-actuator networks are being explored to extend WSNs for supporting rich-media sensing, mobile sensing, underwater/underground sensing, and closed-loop sensing and control. These new WSNs will significantly expand the reach of WSNs and have far-reaching impact on WSN applications. In the meantime, they also introduce great challenges to the theory and practice of wireless sensor networking, together with The 6th China Conference of Wireless Sensor Networks (CWSN2012) sponsored by China Computer Federation, cosponsored by China Computer Federation Technical Committee on Sensor Network, and organized by Nanjing University of Posts and Telecommunication. CWSN2012 serves as a forum for sensor network researchers, developers, and users to communicate the productions and experience of sensor network research and applications. Authors of selected English papers in CWSN2012 were invited to submit their extended versions of their papers to this special issue. Also, some research articles were submitted from the manuscript tracking system as regular submissions to this special issue. This special issue aims at providing researchers and practitioners from the academia, industry, and government an opportunity to reflect upon these new developments of WSNs, including their architectures, protocols, novel characteristics, challenges, and real-world deployments. We have accepted a few papers that address the state of the art and the future directions of these research and application areas for wireless sensor networks in this issue.

The paper "*Two-layer storage scheme and repair method of failure data in wireless sensor networks*" describes a two-layer distributed data storage scheme in wireless sensor networks. The proposed storage scheme and repair method has lower repair communication overhead, which can reduce the repair communication overhead to times and is suitable for resource-constrained distributed wireless sensor networks.

The paper "*Target Q-coverage problem with bounded service delay in directional sensor networks*" addresses the target Q-coverage (TQC) problem to prolong the network lifetime with bounded service delay constraint in directional sensor networks. A protocol to find a collection of coverage sets that satisfy the coverage quality requirement and the bounded service delay constraint is proposed, and simulation results show that performance of this protocol is close to the upper bound of the optimal solution.

The paper "*A virtual-ring-based data storage and retrieval scheme in wireless sensor networks*" proposes a virtual-ring-based data storage and retrieval scheme, which is called VRS,

to take the frequencies of event and query into consideration for wireless sensor networks. In VRS, the whole sensor network field is divided into some virtual rings. According to the frequencies, one of the virtual rings is selected as the rendezvous ring, which plays the role of a bridge between the information consumers and the information producers.

The paper "*Novel side information generation algorithm of multiview distributed video coding for multimedia sensor networks*" proposes a multiview distributed video coding algorithm by gaining the intense motion regions of the Wyner-Ziv frame according to the criteria of ROI, and for nonintense motion regions, motion compensation interpolation (MCI) is utilized to generate side information. Finally, side information based on fusion of temporal and spatial side information will be gained.

The paper "*A stochastic k-coverage scheduling algorithm in wireless sensor networks*" focuses on the K-coverage scheduling problem to guarantee coverage sensing and network connectivity. Deterministic and stochastic sensing models of the sensors were both considered and the authors adapted the results of deterministic sensing model to solve the sensor scheduling problem under the stochastic sensing model. Theoretical analysis and simulation results show that this algorithm can reduce the number of active nodes and extend the network lifetime significantly.

The paper "*Truthful relay assignment for cooperative communication in wireless networks with selfish source-destination pairs*" aims at propose a relay assignment protocol (RA-VCG) for cooperative communication to maximize the total social value while guaranteeing truthfulness in an auction-theoretic sense by charging each pair an extra payment. Simulation results demonstrate the effectiveness of this protocol.

The paper "*A camera nodes correlation model based on 3D sensing in wireless multimedia sensor networks*" studies the visual information retrieved from adjacent camera nodes that usually exhibits high levels of correlation for wireless multimedia sensor networks. Firstly, a correlation model is proposed by measuring the intersection area of multiple camera nodes' field of views. Then, cluster structures are established to cooperate on image processing and transmission tasks. A set of experiments are performed to show the proposed network topology and image fusion, and transmission scheme released the pressure of camera node greatly and reduced the network energy consumption of communication efficiently.

The paper "*An open conformance test system towards the standardization of wireless sensor networks*" analyzes IPv6-based WSN protocols and the conformance testing techniques and methods for IPv6-based WSNs. A novel conformance test system for IPv6-based WSNs is designed and implemented, which is open, flexible, full featured, and practical. The related outcomes will promote the standardization and commercialization of WSNs.

The paper "*A data gathering in opportunistic wireless sensor networks*" studies the challenging problem to effectively collect the sensing data in opportunistic wireless sensor networks, and an efficient data gathering algorithm based on location prediction is proposed for opportunistic wireless sensor networks. Extensive experimental results show that the proposed algorithm is effective to reduce the message transmissions and improve the data collection coverage rate.

The paper "*Optimal convergecast scheduling limits for clustered industrial wireless sensor networks*" investigates the performance bounds of the convergecast scheduling. Firstly, by establish the lower bounds on the number of time slots to finish the intracluster and the intercluster convergecast transmissions. Then, the lower bounds on the number of channels based on the lower bounds on the number of timeslots and maximum available channels in a multichannel scenario is established. Lastly, extensive analysis-taking packet retransmissions is carried out to meet the reliability requirement. Experiment results validate the correctness and tightness of theory analysis is this paper.

The paper "*MPD-model: a distributed multipreference-driven data fusion model and its application in a WSNs-based healthcare monitoring system*" proposes a novel distributed multipreference-driven data fusion model (MPD-Model) for WSNs using distributed multipreference feature-level fusion algorithm, light-weight adaptive feature extraction algorithm, and SVM-based algorithm for health status detection tasks. We implement the proposed methods in a real wearable healthcare monitoring system and validate the proposed methods using real-world data sets with 2046 pulse samples. Experimental results show that the proposed MPD-Model is reasonable and effective.

The paper "*Probability model based coverage-enhancing algorithm for WSNs of nodes' adjustable movement pattern*" proposed a novel algorithm named as PRMCA (probability model based rotate or move along fixed direction coverage-enhancing algorithm), which determines whether the sensor node rotates or moves along a fixed direction according to the coverage effect. A set of simulation experiments verify the performance of the proposed algorithm.

The paper "*Interference-aware fault-tolerant energy spanner in wireless ad hoc networks*" addresses the power assignment in wireless ad hoc networks which induced communication graph that meets the following properties: (1) it is an energy-t-spanner which is energy efficient; (2) it is k-fault resistant which can withstand up to node failures; (3) the interference is minimal. Both the theoretic analysis and the simulations in the paper prove that these algorithms can induce a k-fault resistant energy spanner and furthermore the interference is minimized.

The paper "*An adaptive opportunistic network coding mechanism in wireless multimedia sensor networks*" proposed an adaptive opportunistic network coding mechanism (AONC) to improve video communication performance in wireless multimedia sensor networks. A novel asymmetric coding method to improve data exchange gain is proposed, and opportunistic forwarding strategy based on dynamic priority to achieve much higher is designed. Simulation results demonstrate that AONC can greatly enhance video transmission quality and efficiently utilize bandwidth and energy resources.

The paper "*L-shaped-sensor-arrays-based localization and tracking method for 3D maneuvering target*" analyzes localization and tracking technology for three-dimensional target in wireless sensor networks. A novel closed-loop system to

detect 3D maneuvering targets is designed, which firstly uses L-shaped sensor arrays to sample the signals of maneuvering targets, then 2D ESPRIT algorithm and maximum likelihood algorithm are introduced to achieve the positions of the spatial targets; thirdly, an autoregressive (AR) particle filter (PF) algorithm is realized to predict the locations in next moment; finally, localization process is directed by predicted positions to form a positive feedback closed-loop. Experiment results show that robustness and accuracy of localization and tracking for three-dimensional targets can be enhanced using this system.

The paper "*Stair scheduling for data collection in wireless sensor networks*" addresses the low-tier stair scheduling method problem for two-tiered sensor networks. The energy and communication reliability models of stair scheduling with respect to the size of clusters and LN parameters are analyzed and used to optimize the tier design of the network. The simulation results show that the performances of stair scheduling are much better than that of random scheduling algorithms.

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